

ALUMINUM

Project Fact Sheet



INERT METAL ANODE LIFE IN LOW TEMPERATURE ALUMINUM REDUCTION PROCESS

BENEFITS

- Reduction in electrical energy consumption to about 5.0 kilowatt hour (kWh) per pound of aluminum versus the prevailing average of 7.5 kWh per pound
- Potential energy cost savings of \$90 million annually in the U.S. by 2010
- Reduction in consumption of non-renewable resources
- Elimination of carbon and perfluorocarbon emissions
- Elimination of the health hazards, environmental hazards and costs associated with potliner disposal
- Potential non-energy savings of \$60 million annually in the U.S. by 2010 due to reduced capital and environmental costs

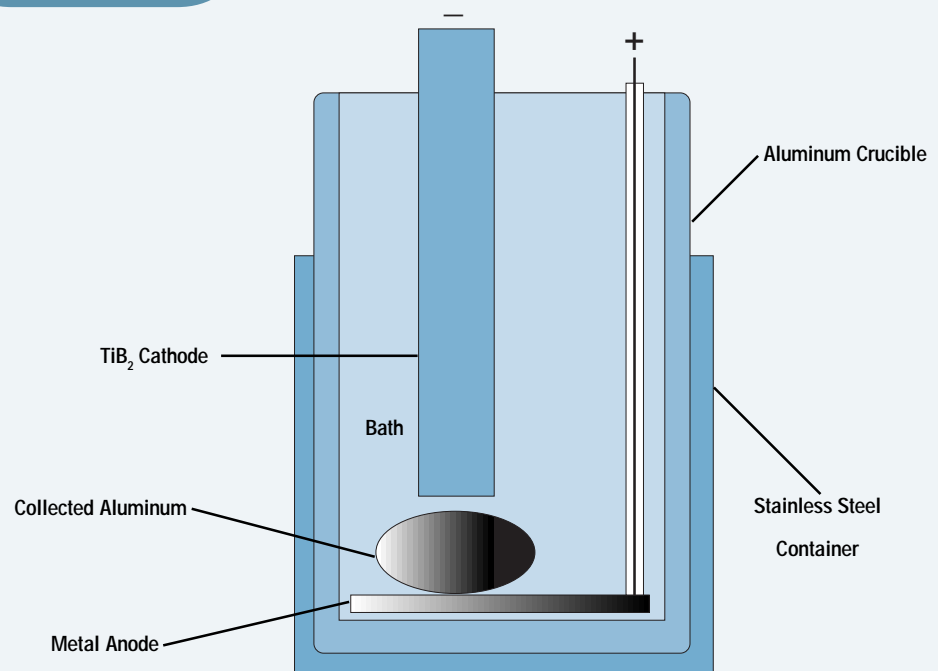
APPLICATIONS

This new primary aluminum smelting technology could replace existing traditional Hall-Héroult production cells in the U.S. and could be used for new production cells.

A LOW-ENERGY, CARBON-FREE ALUMINUM PRODUCTION CELL WILL PROVIDE AN ALTERNATIVE FOR PRIMARY ALUMINUM PRODUCTION

A carbon-free aluminum reduction process is being developed as a modification to the century-old Hall-Héroult process for primary aluminum production. The innovative concept of a vertical electrode slurry cell with a metal alloy anode lining underpins the new process being developed as a retrofit technology for primary aluminum. The process uses a non-consumable metal alloy anode, a wetted cathode, and an electrolytic bath, which is kept saturated with alumina at the relatively low temperature of 750°C by means of free alumina particles suspended in the bath. This technology, once developed, will produce primary aluminum metal with lower energy intensity, lower cost, and lower environmental degradation than the conventional process. Annually, over four million tons of aluminum is produced in the U.S. by smelting. More than 63,000 British thermal units (Btu) per pound are consumed in the process. This new smelting process could cut the energy need for primary aluminum production by 25 to 30 percent and significantly enhance the economic competitiveness of the aluminum industry.

ALUMINA CRUCIBLE CELL



The alumina crucible cell improves a typical Hall-Héroult cell by significantly reducing the voltage required.



Project Description

Goal: Produce aluminum of acceptable purity using the low temperature carbon-free process with energy consumption of about five kWh per pound.

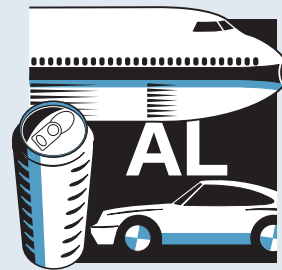
The two-year project has two primary tasks. First, laboratory scale cells will be operated to firmly establish the viability of the fundamental concepts required for a successful commercial process. Second, a pilot scale 5000-ampere (Amp) cell will be designed, constructed and operated. This task will address engineering aspects associated with scaling, such as liner fabrication, electrode configuration and design, and bath composition adjustments. If preliminary operation goes as planned, the cell will stay in operation for long-term observation.

Progress and Milestones

- Complete Long-Term Lab Scale Cell Testing (Summer 1999)
- Evaluate Cell Performance Against the Models (Summer 1999)
- Design 5000-Amp Pilot Cell (Summer 1999)
- Construct Pilot Cell (Fall 1999)
- Complete Year-Long Operation of Pilot Cell (Fall 2000)

Commercialization Plan

If the project is successful, a commercial prototype will be developed in the near-term time frame.



PROJECT PARTNERS

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